# A Stalked Jellyfish (Stauromedusae), Found at Black Rock, Port Phillip Bay. A First Recording in Australia.

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For a number of years I have been interested in observing microscopic marine life and for this purpose have arranged a series of four litre ice cream containers as marine aquariums. The lids of the containers, cut to fit, serve as shelves which are resting on margarine tubs. On the shelves are placed a number of petri dishes. Well aerated sea water is kept 20 mm above the top of the petri dishes (McInnes 1982).

To make an observation, all that is necessary is to lift out the petri dish, place it in a larger petri dish and place this on the stage of the microscope (any water spilt goes into the larger dish instead of onto the microscope). I make my first observations with a low power stereoscopic microscope. If higher powers are needed, the depth of the water in the small petri dish is reduced to 5 mm and the outside carefully dried. The dish can then be placed on the stage of a binocular microscope and observed at higher magnifications. Using a 40x water immersion objective that can be dipped straight into the petri dish, magnifications of 400x or even 800x are possible.

This set up has enabled me to see hydroids producing their medusae, the life story of strange foraminifera, protozoans of all shapes and colours (one a bright pink), polycheate worms of all sorts, mollusc eggs hatching into veligers, the blood stream in sea squirts, a marine amoeba packed full of cubic crystals, in fact a fascinating picture of marine microscopic life at any time.

Back in February 1982, while exploring one of the petri dishes, I found something new to me. At first I thought it was just a loose tentacle of the "walking jellyfish", the medusa of the hydroid *Eleutheria* (Bishop 1972). Figure 1 shows what was seen. The total length was only 0.5 mm so without a microscope it would never have been seen. Closer observation showed that it had attached itself to the glass by a disc at one end, and was swaying from side to side. There were 3 tentacles and what looked like a rounded bud that might later become a fourth tentacle. Each tentacle had a round knob of stinging capsules and the stem of the tentacle had an elbow with a flattened bump at the elbow. What could it be?

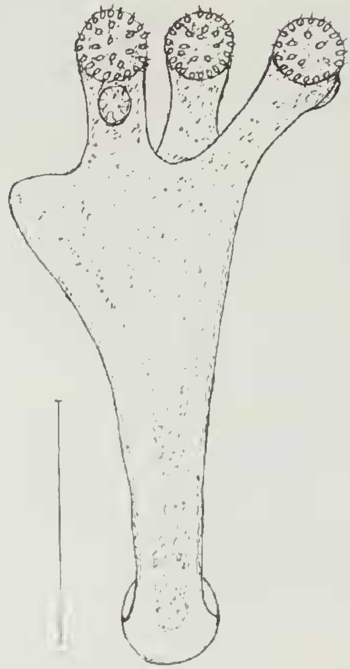

Fig. 1. Early stage of stalked jellyfish found in the petri dishes, elbow starting to form (bar = 0.25 mm).

A few days later I found a specimen the same length (0.5 mm) with four tentacles at the same stage of development (fig. 2). Dr. Dick Hamond, a marine biologist, saw the specimens and suggested that they may be the young of a jellyfish, possibly a member of the genus *Lucernaria*. This genus belongs to the group of jellyfish that have a stalk with an adhesive base which attaches to the stems of seaweed and the jellyfish hang downward.

During March I saw many similar specimens in the petri dishes. All specimens were the same length but the number of tentacles varied. Some had one tentacle, others had 3 or 4, and one specimen each of 5 and 6 tentacles. I then found a specimen with 8 tentacles. This specimen was longer (1.5 mm) and is shown in figure 3, (note the elbows).

This organism demonstrates a rapid bending movement of the body when prey such as small shrimp swim past. The movement is similar to the action of the freshwater hydra. If a small shrimp came into contact with the tentacles of the jellyfish, the stinging capsules at the end of the tentacle shot out their barbed threads and captured the shrimp. The tentacles then drew the prey to the mouth in the centre of the tentacles where it was engulfed, ready for digestion.

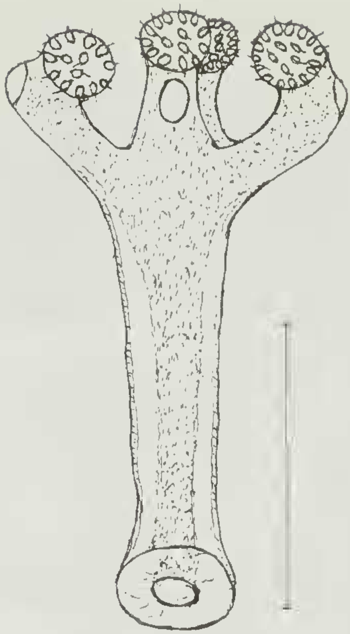

Fig. 2. Later stage of stalked jellyfish (bar = 0.25 mm).

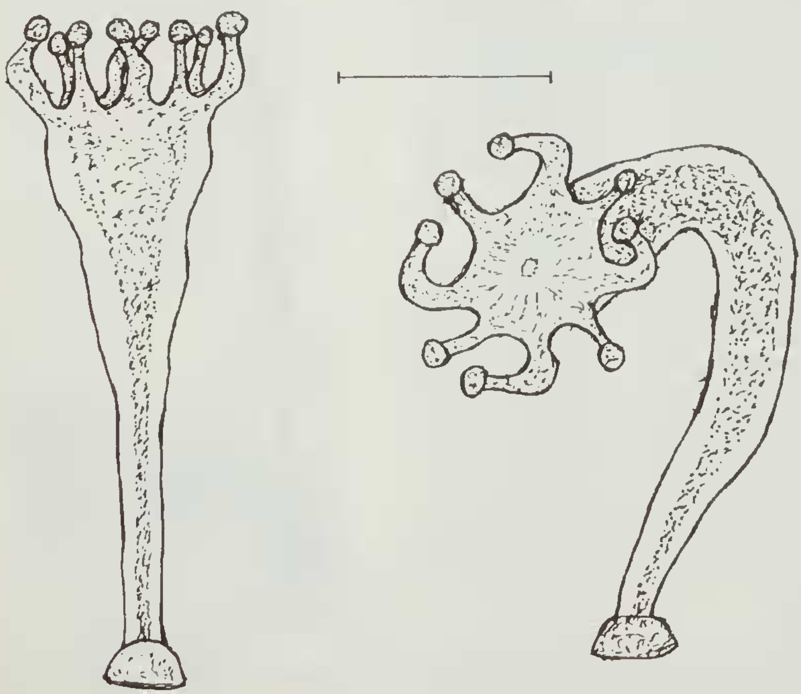

Fig. 3. Later stage with eight tentacles all showing the elbowed shape (bar = 0.5 mm).

A search for information about *Lucernaria* showed many forms of stalked jellyfish but none seemed to fit the pattern of the specimens found at Black Rock. A specimen was exhibited at a meeting of the Field Naturalists Club of Victoria in May 1984 under the heading "A stalked jellyfish from the family Lucernaridae". Later, an illustration of *Stenoscyphus inabai* from Japan in 'The Medusae of the World' by P. L. Kramp just seemed to fit the details of the Black Rock specimens. Could it be the same species?

The higher jellyfish or Scyphozoa generally have a sessile polyp stage when immature which is followed by a free-swimming medusa stage when mature. However, there is one order, the Stauromedusae, in which the members are not free-swimming when mature but stay attached to some substrate by a stalk. The Stauromedusae are generally considered to live in deep or colder waters.

In the book 'Marine Invertebrates of Southern Australia' a chapter on Cnidaria by Dr. R. V. Southcott (1982) contains the statement that "no Stauromedusae are known to occur in southern Australian waters." This made me wonder about the identity of the Black Rock specimens and I wrote to Dr Southcott to ask if he was interested in any specimen that I could send him. Dr. Southcott replied expressing interest in any specimens that could be sent to him. Dr. Southcott later sent me a copy of the article by K. Kishinouye (1902) which describes a new genus in the Stauromedusae, *Stenoscyphus inabai* (fig. 4). The illustrations and description of this species fitted perfectly with the specimens found at Black Rock.

Encouraged by Dr. Southcott's interest I began a series of notes on specimens of *Stenoscyphus* found at Black Rock and sent these and the specimens to Dr. Southcott who has sent them on to the Adelaide Museum.

The description of *Stenocyphus* gave a maximum length of 25 mm and this gave me some idea of what I may find. And where and how did I find them? Well – I have only found them on the brown seaweed *Cystophora exspansa* which grows just below the low tide level (the sublittorial zone). It is seasonal in growth and

**Fig. 4.** Illustration of *Stenoscyphus inabai* by K. Kishinouye (1902). Journal of the College of Science, Japan.

disappears completely in late December and January. I collect three buckets of the seaweed and sea water and then examine every part of the seaweed at home under a low power stereo microscope. This takes 2 or 3 days and if I'm lucky I may find 1 or 2 specimens of the stalked jellyfish. The colour of *Stenoscyphus* matches the brown colour of the seaweed and it is only the movement of the animal that allows it to be detected.

Most of the *S. inabai* found on the *Cystophora* are from 4 to 9 mm in length. A change in the form and number of tentacles takes place with time. The eight elbowed tentacles seen in the early stage (fig. 3) change drastically. The sphere of stinging capsules (nematocysts) gradually becoming absorbed into the bump at the

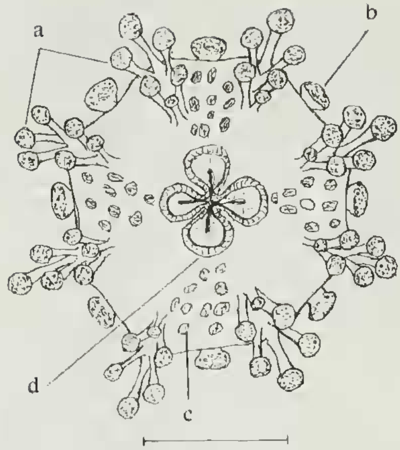


**Fig. 6.** A view of the subumbrellar or inner side of the bell in an everted position showing a) Secondary tentacles, b) Anchors, c) Nematocyst clusters and d) Four-lobed mouth (bar = 1.0 mm).

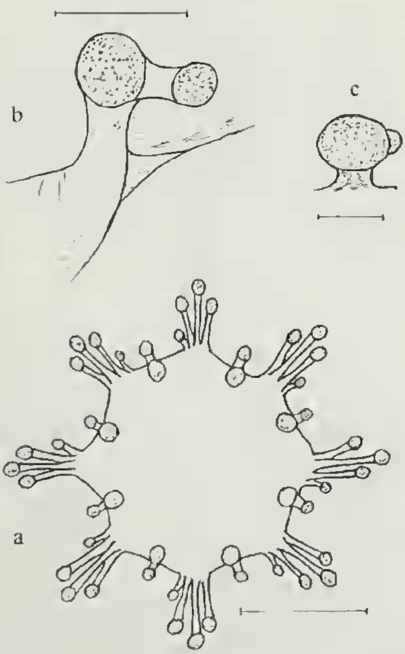


**Fig. 5a.** Sketch of outer side of bell (with stalk omitted) showing position of the elbowed tentacles and the secondary tentacles. (bar = 0.5 mm). **b.** The shrinking of the sphere of stinging capsules into the adhesive anchor (bar = 0.25 mm). **c.** The elbowed tentacle nearly reduced to the round adhesive anchor (bar = 0.25 mm).

elbow which becomes an adhesive circle (the anchor) situated on the outer side of the bell edge (exumbrellar surface) (fig. 5).

Inside the edge of the bell (the subumbrellar surface), between the anchors, there develops a clump of stalked tentacles called 'secondary tentacles'. Each tentacle has a rounded knob of stinging capsules. The number of tentacles increases with the age of the medusa e.g. 4 mm medusa had groups of 3 secondary tentacles, 6 mm medusa had groups of 6 tentacles and 9 mm medusa had 8 tentacles. The largest medusa I have found was 23 mm long and there were 11 tentacles in the groups but Kishinouye (1902) writes of 25 tentacles in groups. Between the groups of secondary tentacles, embedded in the subumbrellar surface are groups of nematocysts and in the centre of the bell is the four-lobed mouth (fig. 6) which will expand to swallow a shrimp as long as the bell is wide.

At an F.N.C.V. meeting in August 1986 a couple of medusae were shown under the microscope but this time as *Stenocyphus inabai* and as a possible first record for Australia.

Experiments were made to keep the medusae alive in jars. Small shrimps *(Chiltonia subtenuis?)* were placed in the jars as food for the medusa and some green sea lettuce *(Ulva)* or a fragment of the brown seaweed *(Cystophora)* as food for the shrimps. The ideal shrimp size seemed to be the width of the bell of the medusa or smaller because they could be caught and swallowed by the medusa. Although several shrimps were kept in each jar no more than one outer skin was found ejected per day.

The water was changed each day due to the large amount of excreta from the shrimps. The reaction to the presence of the shrimps seemed at most times sluggish. Even when a shrimp bumped into the tentacles and became attached, the medusa was very slow to bring other tentacles to grasp the shrimp and very often just let the shrimp struggle away. Large shrimps had a tendency to chew at the stalk of the medusa and twice killed specimens. Sometimes the bell of the medusa will remain party closed and at other times the bell may be wide open, even partly everted with the mouth almost turned inside out (fig. 6).

During September I was lucky to find an 18 mm medusa apparently quite mature as it had the double lines of gonad cells along the stalk (fig. 7). Although the medusa was quite active, the stalk when it bent over, flattened like a flat bicycle tube. In younger medusae the stalk always remains a firm round tube whereas in other large medusae found (22 and 23 mm long) the stalks tend to flatten.

The 18 mm medusa had 10 secondary tentacles in the groups. Hoping it might release the gonads if mature, the medusa was placed in a jar with shrimps as food. One day at 5 pm the medusa slowly ejected dozens of minute spheres. At 7 pm there were hundreds of spheres on the bottom of the dish. They were round and granular in appearance and measured 0.04 mm in diameter. I moved the medusa and the shrimps out of the jar so that the eggs? (or gametes) could be observed during

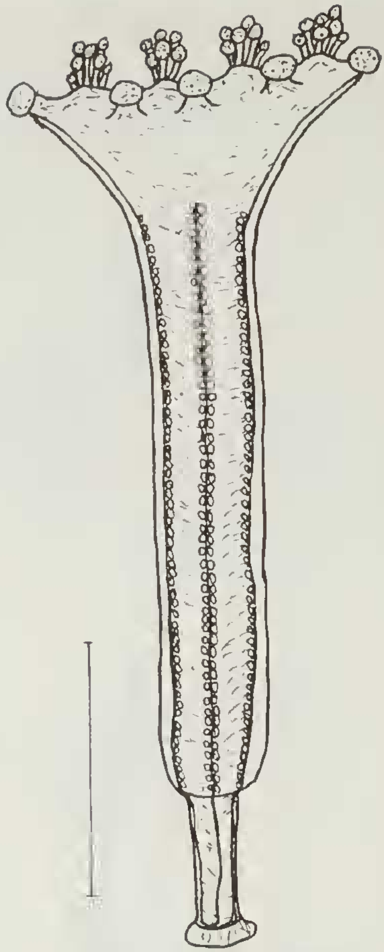

Fig. 7. The mature stalked Jellyfish with the double lines of gonad sacs is very likely *Stenoscyphus inabai*, usually found in Japanese waters (bar = 5.0 mm).

development. The next day more eggs? were ejected and some were placed in different dishes.

One odd aspect was that all the area around the tentacles was blown up and quite thick between the inner and outer layers of the bell but this returned next day to its normal thin layer. Another oddity was the ejection with the eggs? of what seemed to be nematode worms but examination with higher powers of the microscope showed the "worms" to be fine filaments 0.9 mm long and 0.07 mm wide

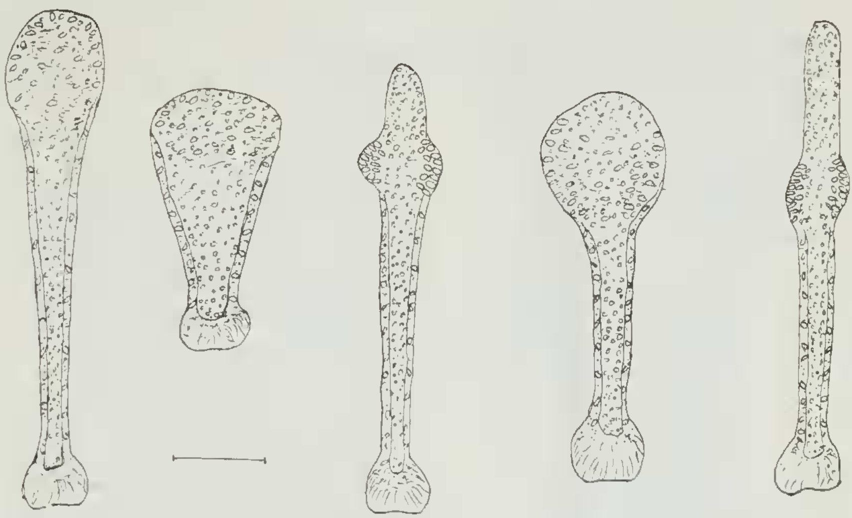

Fig. 8. Early stage. Various shapes of one medusa during a period of 2 hours (bar = 0.1 mm).

and covered on one side with fine cilia. The cilia could be seen beating vigorously. Apparently the filaments are gastral filaments of the medusa that break free at maturity.

I thought the medusa might now disintegrate and be lost so I put it into formalin to send to Dr. Southcott.

Observation of the eggs? continued each day to note any development but in every dish the story was the same, the number of eggs? became less and less each day, examination with high powers revealed the answer, a tiny ciliate had 5 eggs? inside it and even an amoeba only 0.06 mm long and 0.03 mm wide was engulfing the eggs? which were as wide as the amoeba. As there were dozens of ciliates and amoebae no wonder the eggs? disappeared.

None of the eggs? that escaped the predators showed any sign of development, just a slow breakdown of the outer skin and the granular contents. Perhaps the eggs? were not fertile, perhaps it is necessary to have medusae to shed their gonads and cause fertilization.

The hatching of the eggs? into the first stage is a gap in my observation of the life cycle of *Stenoscyphus* but some very early stages were seen in the petri dishes and these are shown in Figs 8, 9 and 10. The smallest stage is only 0.17 mm in length not much bigger than the eggs? at 0.04 mm in diameter.

At Black Rock it seems that the minute forms appear around February to April, in July to August middle sized medusae can be seen, then from September to early December the fully mature medusae with their gonad sacs are about. This life cycle seems to follow the life cycle of the brown seaweed *Cystophora exspansa* that disappears in late December and January.

This raises the question: how is the medusa or rather in what form is the species carried through the period of no seaweed? Are some eggs? in a dormant cyst during this time? An interesting question for someone to find the answer.

The stalked jellyfish has been found at Black Rock and perhaps this article may encourage others to look carefully among the brown seaweeds to see where else they occur.

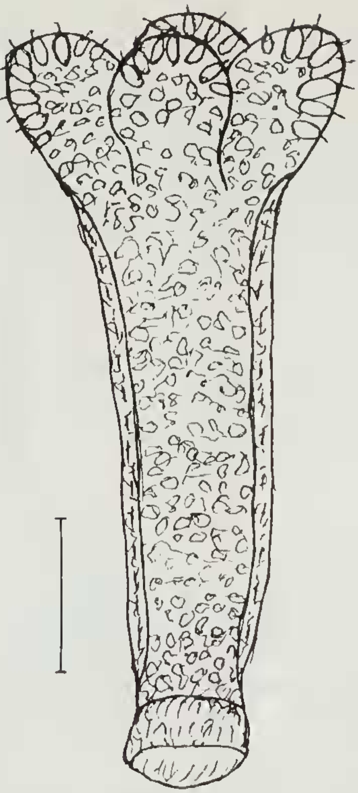

Fig. 9. Early stage. Elbow stage not yet developed (bar = 0.05 mm).

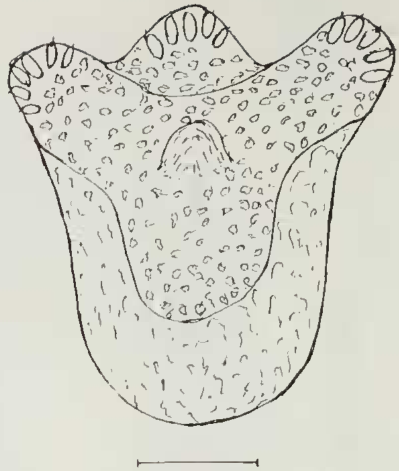

Fig. 10. Earliest stage found. Stinging cell spheres just starting to form (bar = 0.05 mm).

## References

Bishop, H.H. (1972). The ambulatory medusa or walking bud of *Clavatella prolifera*. *Vic. Nat.* **89**: 16-9.

Kishinouye, K. (1902). Some new Scyphomedusae of Japan. *Journal of the College of Science, Imperial University Tokyo*, Japan. **17**: 2.

McInnes, D.E. (1982). Some observations on Hydroids at Black Rock. *Vic. Nat.* **99**: 159-63.

Southcott, R.V. (1982). *Marine Invertebrates of Southern Australia. Part 1.* Pages 115-159.

Uchida, T. (1929). Studies on the Stauromedusae. Japan. *Journal of Zoology.* **2**: 103-113.

## Marine Life Diving Guide

The FNCV is publishing a field guide to the marine life off Wilsons Promontory. This book, the result of intensive underwater research by authors Margaret O'Toole and Malcolm Turner, is designed to assist snorkellers and scuba divers to identify the plants and animals likely to be encountered in the Marine Parks surrounding Wilsons Promontory. It contains not only photographs and text to enable identification but also describes the best places to dive and gives hints on safety, underwater photography, equipment and the logistics of a diving expedition. The guide will also be applicable to other waters off south-eastern Australia and should be welcomed by shore-bound beachcombers as well. It will be the first publication of its kind in Australia. The guide, which will be produced with funds from the Australian Bicentennial Authority, should be available in early 1989.